Recreational Mail Surveys, 1986 — Tidal Sportfishing Diary Program and Visitors Sportfishing Survey

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January, 1988

Canadian Manuscript Report of
Fisheries and Aquatic Sciences
No. 1962

Canadian Manuscript Report of Fisheries and Aquatic Sciences

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RECREATIONAL MAIL SURVEYS, 1986 - TIDAL SPORTFISHING DIARY PROGRAM AND VISITORS SPORTFISHING SURVEY

PREFACE

The Tidal Sportfishing Diary Program was initiated in 1979 to obtain estimates of the sport catch by B.C. residents fishing in B.C. tidal waters. The Visitors Sportfishing Survey was first conducted in 1982 to obtain estimates of sport catch and expenditures by visitors fishing in B.C. tidal waters. Previous reports cover survey development and annual results. This report serves as a continuation of this series and deals with the 1986/87 results.

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ISSN0706-6473.

Correct citation for this publication:

Bijsterveld, L. 1988. Recreational mail surveys, 1986 - Tidal Sportfishing Diary Program and Visitors Sportfishing Survey. Can. MS. Rep. Fish. Aquat. Sci. 1962: iv + 34 p.

RECREATIONAL MAIL SURVEYS, 1985 - TIDAL SPORTFISHING DIARY PROGRAM AND VISITORS SPORTFISHING SURVEY

ABSTRACT

Bijsterveld, L. 1988. Recreational mail surveys, 1986 - Tidal Sportfishing Diary Program and Visitors Sportfishing Survey. Can. MS. Rep. Fish. Aquat. Sci. 1962: iv + 34 p.

Mail surveys collected 1986/87 licence year catch and effort data on recreational fishing in B.C. tidal waters. During 2,107,000 angler days, adult anglers caught and kept 1,931,000 salmon including 516,000 chinook and 1,302,000 coho. Juvenile anglers caught and kept an additional 80,000 chinook and 197,000 coho during 325,000 angler days. Developments in the Diary program and problems related to mail surveys are reviewed.

Keywords: sportfishing, tidal waters, logbook, mail survey, catch statistics

RÉSUMÉ

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Lors d'enquêtes par correspondance, on a recueilli des données sur les efforts et les prises pour la saison de pêche récréative 1986-1987 dans les eaux de marée en C.-B. Pendant 2,107,000 jours-pêcheurs, les pêcheurs adultes à la ligne ont capturé et gardé 1,931,000 saumons dont 516,000 saumons chinook et 1,302,000 saumons coho. Les jeunes pêcheurs à la ligne ont en plus capturé et gardé 80,000 saumons chinook et 197,000 saumons coho en 325,000 jours-pêcheurs. Les développements du programme et les problèmes reliés aux enquêtes par correspondance sont à l'étude.

Mots clés: pêche sportive, eaux de marée, journal de bord, enquête par correspondance, statistiques sur les prises.

RECREATIONAL MAIL SURVEYS, 1986 - TIDAL SPORTFISHING DIARY PROGRAM AND VISITORS SPORTFISHING SURVEY

INTRODUCTION

The Tidal Sportfishing Diary Program is a mail survey of resident B.C. tidal water anglers. The Diary Program was introduced in 1979 as a method of estimating recreational catch and effort. It was necessary to survey large numbers of B.C. adults in order to contact anglers in the absence of a licencing program. The B.C. Tidal Waters Sport Fishing Licence, introduced during 1981, identified anglers and provided a sample base for the program beginning in 1982. The licences also provide a sample base for anglers visiting B.C. The Visitors Sportfishing Survey was first conducted in 1982 to obtain estimates of sport catch and expenditures by anglers visiting B.C. during the previous year. The 1981 and 1982 licence years corresponded to calendar years (January 1 to December 31). The 1983 licence year was a transition from a calendar year to a fiscal year (April 1 to March 31) and extended from January 1, 1983 to March 31, 1984. The Tidal Waters Licence year was changed to correspond to the B.C. Angling Licence year resulting in a 15 month licence for 1983/84. The 1983 Diary program and Visitors Survey covered the entire 15 month period although only the 1983 calendar year statistics were published. The 1986/87 population and catch and effort statistics correspond to the 1986/87 licence year (April 1, 1986 - March 31, 1987).

METHODOLOGY

A systematic sample of 36,000 1985/86 B.C. Tidal Waters Sport Fishing Licences was drawn. The licence information was keypunched directly from the licence stubs to produce an address list. The B.C. addresses were used for the Tidal Diary program while the remainder were used for the Visitors Sportfishing Survey.

Tidal Sportfishing Diary Program

In 1986/87, the Diary Program was conducted as follows: semi-monthly, a new sample or panel of 700 licence holders was mailed a diary form covering a full "month". Half of the panels were responsible for recording fishing activity for a calendar "month", the other half for an interval from the middle of one month to the middle of the next. Data for the first half of the "month" was filled in from memory; data for the second half was filled in as they fished. Reminders were sent to all panel members at the end of the "month". Diarists were provided with return addressed postage paid envelopes for returning the survey forms. Drawings of the 5 salmon species and lingcod, rockfish and halibut were included to aid identification.

Visitors Sportfishing Survey

Approximately 3,200 questionnaires were sent to visiting North American anglers (excluding B.C.). Reminders were sent to questionnaire nonrespondents four weeks after the initial sendout. Questionnaire recipients were asked about their fishing activity in B.C. during the 1986/87 licence year.

RESULTS

Returns

The number of diary returns for each panel of the 1986/87 Diary Program is provided in Table 1. The proportion of respondents fishing during each diary period varies throughout the year, as shown in Table 1.

Approximately 3,200 questionnaires were sent out for the 1985/86 Visitors Survey. The return rate for the Visitors Survey was 73%.

Resident Sportfishing Population

The estimated number of B.C. resident adult anglers in 1986/87 is provided in Table 2. The population is estimated from Sport Fishing licences and consists of adult B.C. resident tidal water anglers (aged 16 and over).

Characteristics of the population of licence holders can be estimated from the sample of licence holders selected to receive questionnaires. Males account for 80% of the population of licence holders while females account for only 20% (Figure 1). The population of B.C. adults, by comparison, is composed of almost equal numbers of males and females (Statistics Canada 1987).

The age composition of the B.C. adult population is presented in Figure 2. The proportion of individuals between 26 and 54 years of age is higher among licenced anglers than among B.C. adults in general. More young adults and people 55 years of age and over are present in the total population of adults (Statistics Canada 1987).

TABLE 1

DIARY RETURNS - 1986/87

Panel Period	Undeliverable	Total Possible Response	Number Respondents	Adjusted Response (%)	% That Fished
Apr. 01/86-Apr. 30/86	49	301	130	43%	7%
Apr. 16/86-May 15/86	36	664	377	57%	10%
May 01/86-May 31/86	46	654	359	55%	13%
May 16/86-Jun. 15/86	49	651	324	50%	20%
Jun. 01/86-Jun. 30/86	58	642	370	58%	25%
Jun. 16/86-Jul. 15/86	55	645	336	52%	28%
Jul. 01/86-Jul. 31/86	64	636	335	53%	37%
Jul. 15/86-Aug. 15/86	93	607	292	48%	39%
Aug. 01/86-Aug. 31/86	88	612	319	52%	37%
Aug. 16/86-Sep. 15/86	51	649	294	45%	26%
Sep. 01/86-Sep. 30/86	78	622	238	38%	33%
Sep. 15/86-Oct. 15/86	76	624	312	50%	24%
Oct. 01/86-Oct. 31/86	70	630	356	57%	15%
Oct. 15/86-Nov. 15/86	80	620	356	57%	12%
Nov. 01/86-Nov. 31/86	85	615	339	55%	7%
Nov. 15/86-Dec. 15/86	92	608	364	60%	5%
Dec. 01/86-Dec. 31/86	84	616	355	58%	7%
Dec. 15/86-Jan. 15/87	88	612	352	58%	6%
Jan. 01/87-Jan. 31/87	102	598	348	58%	6%
Jan. 16/87-Feb. 15/87	104	596	361	61%	5%
Feb. 01/87-Feb. 28/87	81	619	342	55%	6%
Feb. 16/87-Mar. 15/87	118	582	398	68%	4%
Mar. 01/87-Mar. 31/87	109	591	338	57%	5%
Mar. 16/87-Apr. 15/87	125	575	340	59%	8%
TOTAL	1,881	14,659	7,935	54%	16%

TABLE 2

POPULATION OF B.C. RESIDENT TIDAL WATER ANGLERS
ESTIMATED FROM LICENCE SALES

Year	Number of Anglers
1981	203,000
1982	223,000
1983/84	224,000
1984/85	225,000
1985/86	239,000
1986/87	242,000

The distribution of B.C. residents and licenced anglers by area of residence is presented in Figure 3. Eighty percent of licenced anglers are from Vancouver Island and the Greater Vancouver area. These areas account for only 62% of the total population of B.C. (Statistics Canada 1987). The proportion of licenced anglers is higher than the proportion of the population in coastal areas, with the exception of Greater Vancouver.

Population of Visiting Anglers

An estimated 110,000 visiting anglers fished in B.C. tidal waters in 1986/87. The population consisted of 44,800 Canadians, 61,300 U.S. visitors and 3,800 visitors from other countries (Table 3). The sex composition of the population of visiting anglers is similar to the composition of B.C. resident anglers. Males account for 81% of the visiting population and females account for 19%.

The age composition of the population of visiting anglers is presented in Figure 2. The proportion of individuals over the age of age 45 is higher among visiting anglers than among B.C. resident anglers.

The proportion of visiting anglers from various areas in Canada and the U.S. is presented in Table 4. Almost half of the visiting anglers originated from areas adjacent to B.C. (Alberta and Washington). Americans accounted for 56% of the visiting anglers while Canadians accounted for 41%. The remaining 3% of the visiting anglers originated from outside North America.

TABLE 3

POPULATION OF VISITING ANGLERS
ESTIMATED FROM LICENCE SALES

Year	Country of Origin			
	Canada	U.S.A.	Other	Total
1981	32,300	43,100	3,600	79,000
1982	28,700	40,900	1,500	71,100
1983/84	30,300	42,600	2,000	74,900
1984/85	25,700	51,600	300	77,600
1985/86	27,200	63,600	2,600	93,400
1986/87	44,800	61,300	3,900	110,000

FIGURE 1

SEX COMPOSITION OF B.C. ADULTS, ANGLERS AND VISITING ANGLERS - 1986/87

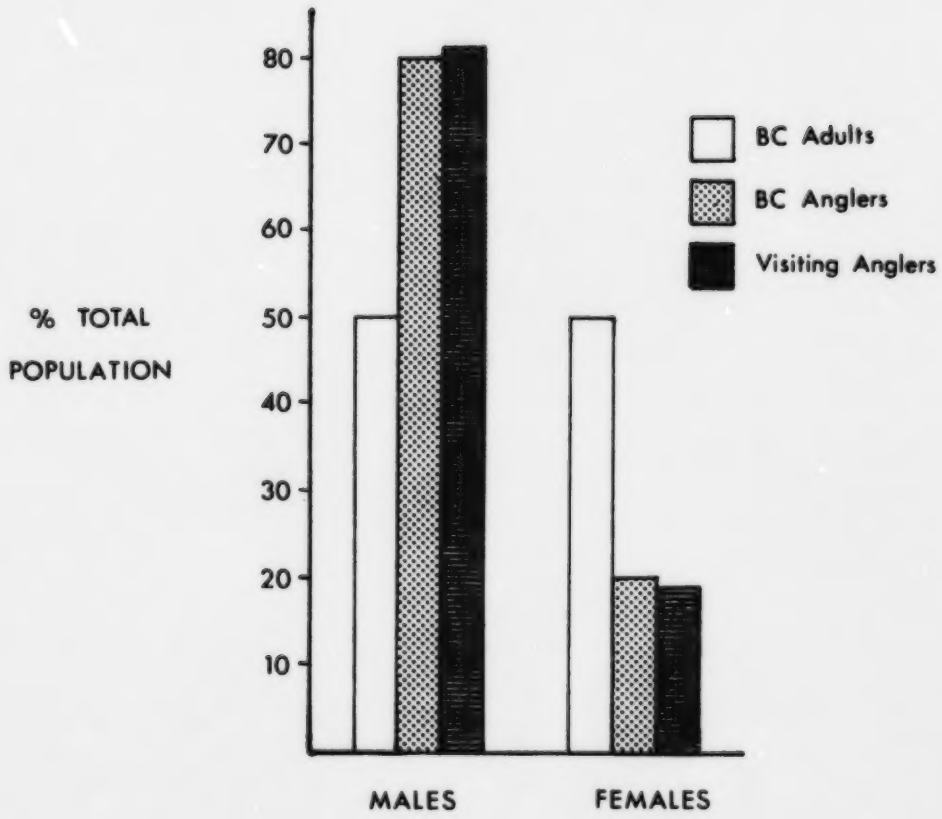
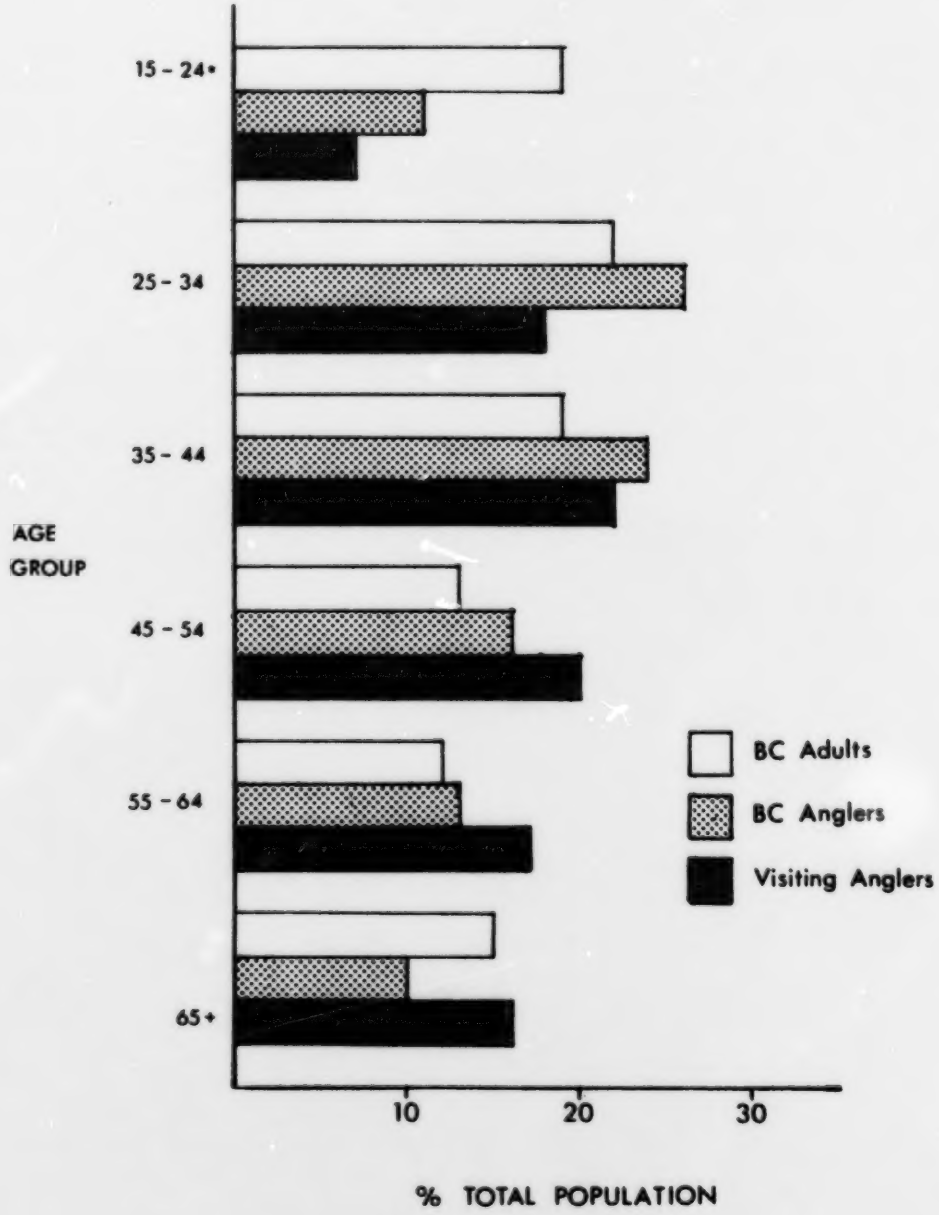


FIGURE 2

AGE COMPOSITION OF B.C. ADULTS, ANGLERS AND VISITING ANGLERS - 1986/87



* Age group for anglers is 16 - 24.

FIGURE 3

DISTRIBUTION OF B.C. RESIDENTS AND LICENCED ANGLERS
BY RESIDENCE AREA - 1986/87

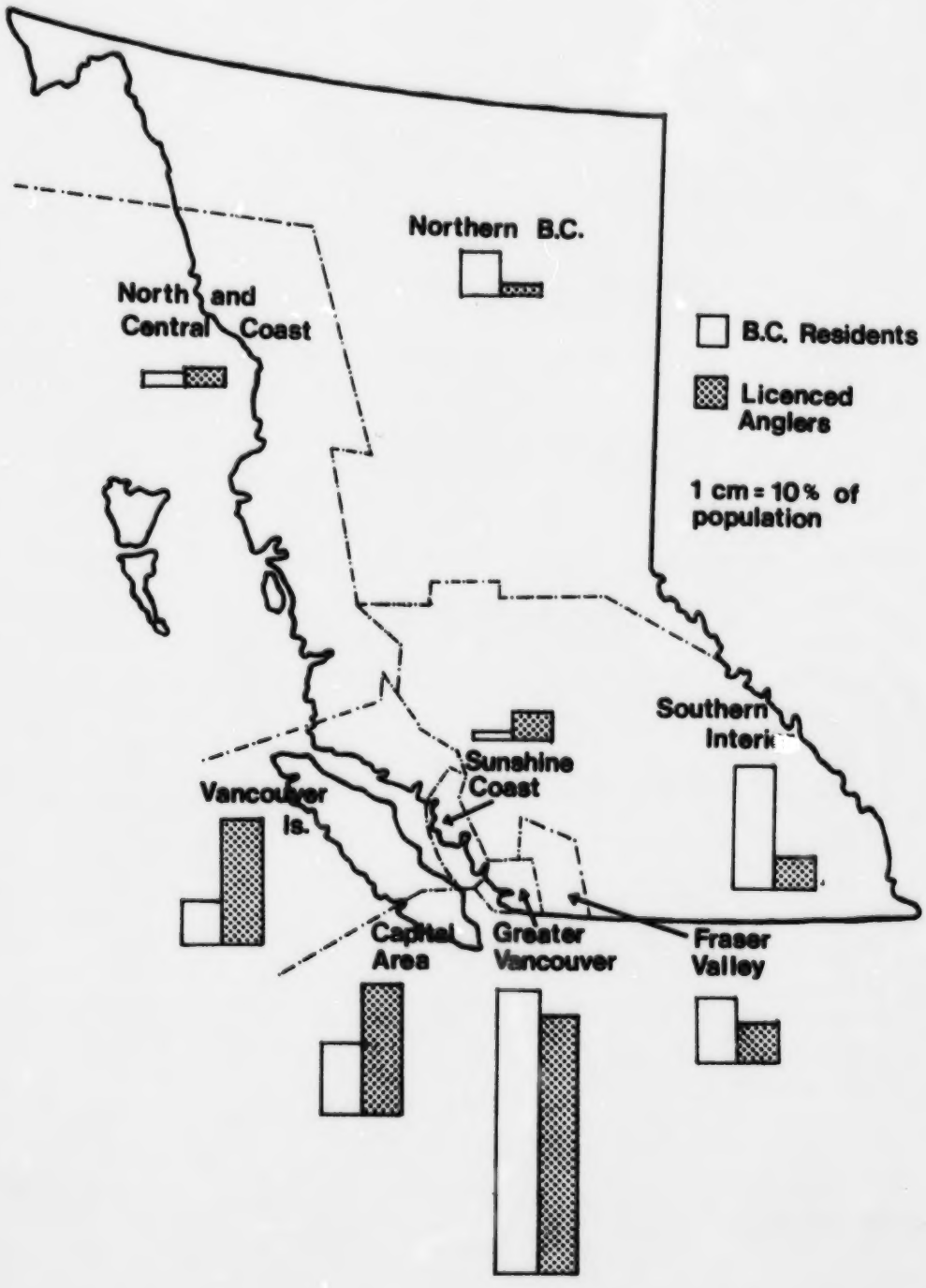


TABLE 4

RESIDENCE OF VISITING ANGLERS - 1986/87

CANADA

Province	Percentage of Total Visiting Anglers
Alberta	23
Ontario	9
Saskatchewan	4
Other	5
Total Canada	41

UNITED STATES

State	Percentage of Total Visiting Anglers
Washington	22
California	14
Oregon	4
Other	16
Total United States	56

Catch

British Columbia resident adult anglers caught and retained 1,513,000 salmon during the 1986/87 licence year (Table 5). The catch consisted of 389,000 chinook, 1,042,000 coho, and 82,000 salmon of other species.

Visiting anglers caught an additional 418,000 salmon, consisting of 127,000 chinook, 261,000 coho and 30,000 salmon of other species (Table 6). The combined catch by B.C. resident and visiting anglers was 516,000 chinook, 1,302,000 coho and 112,000 salmon of other species, resulting in a total catch of 1,931,000 salmon in 1986/87 (Table 9).

Most of the salmon were caught inside Vancouver Island. This area accounted for 83% of the chinook, 88% of the coho and 85% of the total salmon caught and kept by B.C. resident anglers in 1986/87. This area contributed a smaller proportion (81%) of the total salmon catch by visiting anglers.

Over half of the salmon were taken during the summer months (June, July and August) in 1986/87 (Table 10). The total salmon and coho catches peaked in August while the chinook catch peaked a month earlier.

British Columbia residents also caught and retained 208,000 lingcod, 549,000 rockfish and 31,000 halibut during the 1986/87 licence year (Table 7). Visiting anglers caught an additional 77,000 lingcod, 99,000 rockfish and 7,000 halibut (Table 8). The combined catch by B.C. resident and visiting anglers was 285,000 lingcod, 648,000 rockfish and 39,000 halibut (Table 9).

Over 80% of the rockfish and lingcod caught by both residents and visitors were taken from waters inside Vancouver Island. Almost equal proportions of halibut were taken by B.C. residents from waters inside Vancouver Island (46%) and north of Vancouver Island (49%). Visitors took a similar proportion of halibut from waters inside Vancouver Island (45%) but a larger proportion from waters west of Vancouver Island (41%).

TABLE 5

1986/87 TIDAL SPORTFISHING DIARY PROGRAM
B.C. ADULT RESIDENT SALMON CATCH[1] AND EFFORT BY REGION ('000's)

Region of Catch	Angler Days	Chinook	Coho	Other Salmon	Total Salmon
North Coast (Areas 1-6)[2]	72.6	16.8	36.1	10.8	63.6
Central Coast (Areas 7-11)[2]	20.1	4.3	12.3	4.9	21.5
E. Vancouver Is. (Areas 12-14)[2]	497.7	129.6	466.0	17.6	613.3
Sunshine Coast (Areas 15-16)[2]	194.0	47.0	129.9	2.2	179.1
S. Vancouver Is. (Areas 17-20)[2]	495.7	112.6	274.6	8.6	395.7
W. Vancouver Is. (Areas 21-27)[2]	116.7	44.4	64.7	14.4	123.6
Lower Mainland (Areas 28-29)[2]	217.7	34.2	58.1	23.9	116.2
Total B.C. (Areas 1-29)[2]	1,614.5	389.0	1,041.7	82.4	1,513.1

[1] Catch is reported as number of fish kept.
[2] Department of Fisheries statistical areas as indicated on the map in Appendix B.

Note: Totals may not equal the sum of the rows and columns due to rounding.

TABLE 6

1986/87 VISITORS SPORTFISHING SURVEY
EFFORT AND SALMON CATCH[1] BY VISITING ANGLERS BY REGION ('000's)

Region of Catch	Angler Days	Chinook	Coho	Other Salmon	Total Salmon
North Coast (Areas 1-6)[2]	13.8	2.4	4.6	2.0	9.0
Central Coast (Areas 7-11)[2]	31.0	8.7	14.8	4.1	27.6
E. Vancouver Is. (Areas 12-14)[2]	240.8	66.3	175.9	17.0	259.4
Sunshine Coast (Areas 15-16)[2]	53.4	8.8	24.0	.3	33.1
S. Vancouver Is. (Areas 17-20)[2]	77.4	14.5	17.1	2.0	33.6
W. Vancouver Is. (Areas 21-27)[2]	53.3	23.1	17.8	3.8	44.7
Lower Mainland (Areas 28-29)[2]	22.7	3.3	6.4	.8	10.5
Total B.C. (Areas 1-29)[2]	492.4	127.2	260.6	30.0	417.7

[1] Catch is reported as number of fish kept.
[2] Department of Fisheries statistical areas as indicated on the map in Appendix B.

Note: Totals may not equal the sum of rows and columns due to rounding.

TABLE 7

1986/87 TIDAL SPORTFISHING DIARY PROGRAM

B.C. ADULT RESIDENT NONSALMON CATCH[1] BY REGION ('000'S)

Region of Catch	Lingcod	Rockfish	Halibut
North Coast (Areas 1-6)[2]	4.8	26.9	10.3
Central Coast (Areas 7-11)[2]	1.9	3.3	5.1
E. Vancouver Is. (Areas 12-14)[2]	56.0	119.1	2.5
Sunshine Coast (Areas 15-16)[2]	47.6	90.2	0.4
S. Vancouver Is. (Areas 17-20)[2]	65.2	224.7	1.4
W. Vancouver Is. (Areas 21-27)[2]	19.1	29.5	1.4
Lower Mainland (Areas 28-29)[2]	13.3	55.0	10.3
Total B.C. (Areas 1-29)[2]	208.0	548.7	31.3

[1] Catch is reported as number of fish kept.
[2] Department of Fisheries statistical areas as indicated on the map in Appendix B.

Note: Totals may not equal the sum of rows and columns due to rounding.

TABLE 8

1986/87 VISITORS SPORTFISHING SURVEY

NONSALMON CATCH[1] BY VISITING ANGLERS BY REGION ('000'S)

Region of Catch	Lingcod	Rockfish	Halibut
North Coast (Areas 1-6)[2]	1.9	2.1	0.4
Central Coast (Areas 7-11)[2]	1.1	1.2	0.7
E. Vancouver Is. (Areas 12-14)[2]	29.1	37.9	2.2
Sunshine Coast (Areas 15-16)[2]	11.3	16.2	0.0
S. Vancouver Is. (Areas 17-20)[2]	20.2	21.8	1.1
W. Vancouver Is. (Areas 21-27)[2]	11.1	17.3	3.0
Lower Mainland (Areas 28-29)[2]	1.7	2.6	0.0
Total B.C. (Areas 1-29)[2]	76.6	99.1	7.4

[1] Catch is reported as number of fish kept.
[2] Department of Fisheries statistical areas as indicated on the map in Appendix B.

Note: Totals may not equal the sum of rows and columns due to rounding.

TABLE 9

1986/87 B.C. TIDAL WATER SPORT CATCH AND EFFORT ('000s)

	B.C. Resident Anglers[1]	Visiting Anglers[2]	Total
Angler Days	1,614.6	492.4	2,107.0
Chinook	389.0	127.2	516.2
Coho	1,041.7	260.6	1,302.3
Other Salmon	82.4	30.0	112.3
Total Salmon	1,513.1	417.7	1,930.8
Lingcod	208.0	76.6	284.5
Rockfish	548.7	99.1	647.8
Halibut	31.3	7.4	38.8

1. Tidal Sportfishing Diary Program.
2. Visitors Sportfishing Survey.

Note: Totals may not equal the sum of rows and columns due to rounding.

TABLE 10

1986/87 B.C. TIDAL WATER SPORT SALMON CATCH[1] ('000's) BY MONTH

Month	Chinook	Coho	Other Salmon	Total Salmon
1986-April	12.8	48.8	1.3	62.8
May	39.1	127.5	4.6	171.2
June	66.0	178.3	2.8	247.1
July	67.7	300.5	24.4	392.6
August	88.5	213.0	11.6	313.1
September	30.5	115.7	23.2	169.4
October	12.6	38.8	11.9	63.2
November	11.8	6.4	1.7	19.9
December	22.4	1.4	.7	24.4
1987-January	10.3	4.5	0	14.9
February	13.9	4.7	.3	18.9
March	13.5	2.2	0	15.6
Total	389.0	1,041.7	82.4	1,513.1

1. Catch is reported as numbers of fish kept.

Effort

British Columbia resident anglers fished an estimated 1.6 million days in 1986/87. Visiting anglers fished an estimated 492,000 days in B.C. tidal waters in the 1986/87 licence year, bringing the total tidal water estimate of effort to 2.1 million days during the 1986/87 licence year.

More than 90% of the finfish effort by B.C. resident anglers occurred from boats. The percentage of effort from boats was much lower around the Fraser River (area 29) due to a closure to salmon sport fishing at the mouth of the Fraser River (Department of Fisheries and Oceans 1986). Fishing from the shore and fishing bars accounted for one third (33%) of the effort in this area in 1986/87.

Over half of the total effort occurs during July through September. Most of the angler effort (85%) occurs inside Vancouver Island.

Catch Per Unit Effort (CPUE)

The average catch per angler day for B.C. resident anglers during 1986/87 was 0.24 chinook, 0.65 coho and 0.94 for all salmon combined (Table 11). The average catch per angler day for visiting anglers was 0.26 chinook, 0.54 coho and 0.87 for all salmon combined. The average CPUE of released salmon by B.C. resident anglers in 1986/87 was 0.24 chinook and 0.22 coho.

Catch and Effort by Juvenile Anglers

The population of anglers aged 15 and under could not be estimated directly from licence sales for 1986/87 because these anglers were not required to purchase B.C. Tidal Waters Sport Fishing Licences prior to the 1987/88 licence year. Based on questionnaire data from the 1982 through 1984 Diary programs, the ratio of B.C. juvenile to adult anglers is 1:4. The

TABLE 11

SALMON CATCH PER UNIT EFFORT

1986/87

	Chinook	Coho	Total Salmon
B.C. Resident Anglers	0.24	0.65	0.94
Visiting Anglers	0.26	0.54	0.87
All Anglers	0.24	0.62	0.92

estimated number of B.C. juvenile anglers in 1986/87 is 60,000. Information on juvenile anglers was not collected by the 1986/87 Visitors Sportfishing Survey. Based on the 1983 through 1984 Visitor surveys, the average ratio of visiting juveniles to adult anglers is 1:3. The estimated number of visiting juvenile anglers in 1986/87 is 37,000.

Other surveys (Cox 1977; Cumming 1979; Pelletier, Lacasse and Ducharme 1981; Thomson 1974) indicate that the average number of days fished by resident juvenile anglers is one-third to two-thirds the average number of days fished by their adult counterparts. Juvenile resident anglers fished an estimated 202,000 days in 1986/87 assuming that each juvenile resident angler fishes half as many days as an adult resident. Visiting juvenile anglers fished an estimated 123,000 days in 1986/87. This estimate is based on the assumption that visiting juveniles fish 75% the number of days fished by visiting adults.

Using the catch rates for adult anglers, resident juvenile anglers caught an estimated 48,000 chinook and 131,000 coho, while visiting juvenile anglers caught an estimated 32,000 chinook and 66,000 coho. These catches are not included in the previously discussed catches by adult anglers.

DISCUSSION

Survey Biases

Certain types of error are associated with any type of survey. One type of error is referred to as nonresponse and results from the failure to measure or contact the entire survey sample (Cochrane 1977). Biased measurements could be obtained if the characteristics of the measured group differ from the group that was not measured. Individuals that voluntarily return questionnaires as part of a mail survey are possibly more interested in the questionnaire subject and could differ from those who don't return questionnaires. Tidal Diary respondents could be more active and successful anglers than nonrespondents. Estimates of fishing activity from this source alone could be biased upwards.

Nonrespondents were surveyed by telephone as part of the 1986/87 Diary program. Survey results indicate that 73% of the nonrespondents fished compared to 74% of the respondents. A chi-square test indicated no difference between these participation rates at the .05 level of significance. Nonrespondents reported fishing more days and catching more salmon, on the average, although these differences are not significant as indicated by t-tests at the .05 level of significance. Catch per angler day (CPUE) can be considered to be a measure of fishing success. The chinook and coho CPUE for respondents were higher but not significantly so as indicated by t-tests at the .05 level of significance. Therefore the nonrespondents were as successful as the respondents.

Another source of error is recall bias and arises because individuals cannot always accurately recall details after time has passed. The result could be either under or over estimating, depending on the subject. This type of bias can be a problem in postseason mail surveys such as the Visitors Survey when the recall period is long. Diary program participants, however,

are asked to recall the last half month only and keep records as they fish for the remainder of the month. For each half month, there is a recalled set of data and a current set of data. Generally, respondents indicated fishing more days and catching more fish when recalling than when keeping current records. The differences between the recalled and current data are significant as indicated by analyses of variance at the .05 level of significance for coho and total salmon.

Error can also result from inaccurate reporting by the respondents. Salmon drawings with identification points were supplied to all of the diarists to assist in correct species identification.

REFERENCES

Cochran, W.G. 1977. Sampling techniques. Wiley and Sons, Toronto. 428p.

Cox, K.W. 1977. Sportfishing in Newfoundland - a survey of anglers. Dep. Fish. Environ., Fish. Mar. Serv., Ottawa. 61p.

Cumming, K.J. 1979. Sportfishing in Nova Scotia - a survey of anglers. Dep. Fish. Oceans, Ottawa. 63p.

Department of Fisheries and Oceans. 1986. British Columbia Tidal Waters Sport Fishing Guide. 28p.

Jeffries, D.C. 1987. 1986 Visitor sportfishing survey data analysis report. Report prepared for the Department of Fisheries and Oceans.

Statistics Canada. 1987. Population and Dwelling Characteristics - Census Divisions and Subdivisions. British Columbia: Part 1, Profiles Publication 94-119.

Thomson, I.D. 1974. Prince Edward Island school survey of anglers. Recreational Fisheries Branch. Fisheries and Marine Service, Environment Canada. 32p.

APPENDIX A

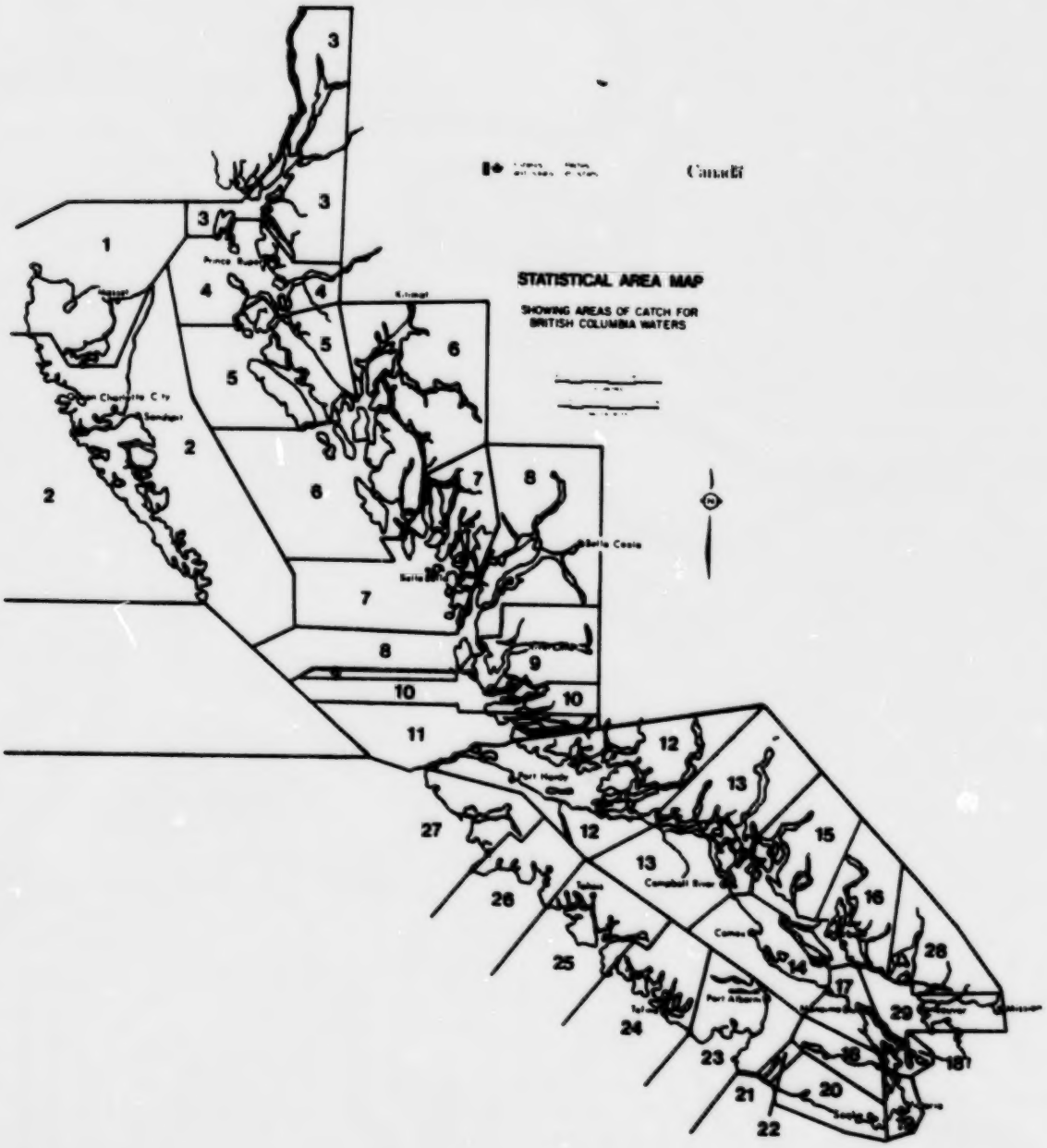
Species List

Common and Scientific Names of Fish Recorded by Tidal Water Anglers

Common Name	Scientific Name
Chinook	*Oncorhynchus tschawytscha*
Coho	*Oncorhynchus kisutch*
Other salmon	*Oncorhynchus* spp.
Lingcod	*Ophiodon elongatus*
Rockfish	*Sebastes* spp.
Halibut	*Hippoglossus stenolepis*

APPENDIX B

Statistical Area Map



APPENDIX C

Tidal Sportfishing Diary Program Calculations

1. Estimating the Population of BC Resident Anglers

A sample of 1986/87 licences was drawn for the 1987/88 mail surveys. From this sample, it was estimated that 87.9% of the resident annual licences were purchased by B.C. residents while 32.2% of the resident one day licences were purchased by B.C. residents. The number of B.C. resident anglers is estimated by multiplying these fractions by the total sales of resident annual and one day licences as follows:

$$ANGBC = (RSALES * .879) + (DSALES * .322)$$

where ANGBC = estimated number of B.C. resident anglers
RSALES = total resident annual licence sales
DSALES = total one day licence sales.

The number of anglers from other provinces, states and countries was estimated using this method and substituting the proportion from the sample for each province or state for each licence type.

2. Estimating Catch and Effort

The estimate for one month is based on data from 3 panels or diary groups. The monthly estimate is considered to be preliminary until the closing deadline for the third panel has been reached.

The formula for the preliminary estimate for one panel in period or half month i is:

$$Y_i = (1-w)C_i + w * \frac{C_i}{R_{i-1}} * Y_{i-1}$$

where C_i= the total reported by the ith panel during the "current" half month.

R_{i-1}= total reported by the ith panel during the "remembered" half month.

Y_{i-1}= the preliminary estimate for period (i-1).

$w = \frac{1 - \sqrt{(1-r^2)}}{r}$, r = correlation between R_{-1} and C.

The final estimate for a panel in period or half month i is:

$$T_i = k * Y_i + (1-k) * R_i$$

where Y_i= the previously defined preliminary estimate.

R_i= the total reported by the (i+1)st panel during the "remembered" half of the month.

$k = \frac{1 - \sqrt{(1-r^2)}}{r^2}$

The formula for the panel size for the preliminary estimate is:

$$\text{panel size} = \frac{kwP_{i-2} + kP_{i-1} + (1-kw)\,P_i + (1-k)\,P_{i+1}}{2}$$

where P_{i-2} = the number of respondents from the (i-2)th panel
P_{i-1} = the number of respondents from the (i-1)th panel
P_i = the number of respondents from the ith panel
P_{i+1} = the number of respondents from the (i+1)th panel
k, w are previously defined.

A final estimate for a month can be made when the closing deadline for the third panel for the month has been reached. The formula for the final estimate for a month m is:

$$X_m = \left[\frac{C_{2m-1}}{n_{2m-1}} + \frac{(R_{2m-1}+C_{2m})}{n_{2m}} + \frac{R_{2m}}{n_{2m+1}} \right] * \frac{N}{2}$$

where X_m = the final estimate for month m

C_i = the total reported by the ith panel during the "current" half month.

R_i = the total reported by the ith panel during the "remembered" half month.

n_i = number of respondents for the ith panel.

N = estimate of total number of anglers.

The panels and periods are illustrated in Figure C1.

FIGURE C1

1986 TIDAL SPORTFISHING DIARY PROGRAM
PERIOD AND PANEL PRESENTATION

APPENDIX D

SAMPLE FORMS

1. Tidal Sportfishing Diary - Page 1

Tidal Sportfishing Diary (Q)

Please record the fishing information even if you caught no fish.

Date	Area (See map)	Fishing From: Boat, Shore, Pier, Bar or Diving	Chinook			Coho			Other Salmon		Other Fish		
			released	kept	# marked	released	kept	# marked	Pink kept	Other Salmon kept	Lingcod kept	Rockfish kept	Halibut kept
Tue Dec 1													
Wed 2													
Thu 3													
Fri 4													
Sat 5													
Sun 6													
Mon 7													
Tue 8													
Wed 9													
Thu 10													
Fri 11													
Sat 12													
Sun 13													
Mon 14													
Tue 15													
Wed 16													
Thu 17													
Fri 18													
Sat 19													
Sun 20													
Mon 21													
Tue 22													
Wed 23													
Thu 24													
Fri 25													
Sat 26													
Sun 27													
Mon 28													
Tue 29													
Wed 30													
Thu 31													

☐ Did not fish during this period.

1. Tidal Sportfishing Diary - Page 2

INSTRUCTIONS

Please record the following information in the appropriate column for each day fished in B.C. tidal waters during the dates covered by this diary form:

1. **Statistical area:** Refer to the map below and record the number that corresponds to your location.

2. **Fishing from:** Boat, shore, pier, river bar or diving only.

3. **Chinook:** The number of chinook caught and released and the number of chinook caught by you personally and kept. The number of marked (fin-clipped or tagged) chinook should be included in the number of chinook released and kept.

4. **Coho:** The number of coho caught and released and the number of coho caught by you personally and kept. The number of marked (fin-clipped or tagged) coho should be included in the number of coho released and kept.

5. **Pink salmon:** The number of pink salmon caught kept by you personally and kept.

6. **Other salmon** The number of chum and sockeye salmon caught by you personally and kept.

7 **Other fish:** The number of lingcod, rockfish and halibut caught by you personally and kept.

Please record the fishing information even if you caught no fish.

Please mail the form at the end of the diary period using the business reply envelope supplied. If you did not fish during the diary period, please check the box at the bottom of the form and return the diary by mail.

2. Visitor Sportfishing Survey - Page 1

VISITORS SPORTFISHING SURVEY

Please fill in the following table, even if you did not catch any fish. Instructions for filling out the table are given below.

MONTH	AREA	DAYS	CHINOOK	COHO	OTHER SALMON	OTHER FISH	
						number	type
July	13	2	2	1	1	2	lingcod
August	14	3	0	0	0	0	

MONTH: Record the month(s) you personally fished in B.C. tidal waters in the 1986/87 licence year (April 1986 through March 1987).

AREA: Refer to the attached map of Fisheries statistical areas, locate the area where you were fishing and record the corresponding area number. If you fished in more than one area in the month, use a separate line for each area fished and record the appropriate information for those areas on separate lines.

DAYS FISHED: Record the days you personally fished in each area in each month, including the days where nothing was caught.

CATCH: In the appropriate column, record the total number of fish caught by you personally. Do not include released fish. Please record king and spring salmon in the "chinook" column and silver salmon in the "coho" column.

FRANCAIS AU VERSO

2. Visitor Sportfishing Survey - Page 2

ENQUÊTE SUR LA PÊCHE SPORTIVE PRATIQUÉE PAR LES VISITEURS

Veuillez remplir le tableau ci-après, même si vous n'avez attrapé aucun poisson. Des intructions sont fournies ci-dessous.

MOIS	SECTEUR	JOURS	QUANTITÉ	COHO	AUTRES SALMONIDÉS	AUTRES POISSONS	
						nombre	espèce
juillet	13	2	2	1	1	2	morue - lingue
août	14	3	0	0	0	0	

MOIS: Indiquez le(s) mois où vous avez personnellement pêché dans les eaux à marée de la C.-B. pendant la période de validité du permis 1986-1987 (d'avril 1986 à mars 1987).

SECTEUR: Reportez-vous à la carte des secteurs statistiques des pêches (ci-dessous), trouvez le secteur où vous avez pêché et inscrivez le numéro correspondant. Si vous avez pêché dans plus d'un secteur au cours d'un même mois, utilisez une ligne pour chaque secteur et indiquez à chaque fois les renseignements correspondant au secteur.

JOURS DE PÊCHE: Indiquez les jours où vous avez personnellement pêché dans chaque secteur pour chaque mois, y compris les jours où vous n'avez rien attrapé.

PRISES: Dans la colonne appropriée, inscrivez le nombre total de poissons vous avez personnellement capturé. N'incluez pas le(s) poisson(s) que vous avez rejeté.

ENGLISH ON REVERSE